ROUTE 33 BRIDGES
Overview and Construction Issues
2007 Virginia Concrete Conference
March 6, 2007
Jamie Browder, PE
Project Manager

Existing Conditions
• Eltham Bridge over the Pamunkey River
  – 2-lane structure posted for legal load limits
  with a Warren Through Truss Swing Span
• Lord Delaware Bridge over the Mattaponi River
  – 2-lane structure posted for legal load limits
  with a Warren Through Truss Swing Span
• Route 33 through the Town of West Point
  – 3-lane curb & gutter roadway with an at grade railroad crossing

Project Purpose
• Replace the existing bridges at the Town of West Point over the Pamunkey and Mattaponi Rivers
• Eliminate the at grade Railroad Crossing
• Widen existing Route 33 through the Town of West Point to accommodate two through lanes of traffic East & West plus turning lanes

Eltham Bridge
• 5,354' long structure
  – Spanning the Thorofare Creek, Pamunkey River, marsh, and existing railroad crossing
• 4-12' lanes with 10' shoulders each side
• Double leaf bascule span over the channel with a minimum vertical clearance of 55' at Mean High Tide
• Brick pilasters on pier caps and lighting

Bascule Test Lift
Lord Delaware Bridge

- 3,545’ long structure
  - Spanning the Mattaponi River and marsh
- 4-12’ lanes with 10’ shoulders each side
- Fixed span with a minimum vertical clearance of 55’ at Mean High Tide over the channel
- Brick pilasters on pier caps and lighting

Route 33 Roadway

- 5-12’ lanes with a right turn lane at the intersection of Route 30
- Curb & gutter typical
- Brick sidewalks and crosswalks with landscaping, benches, trash receptacles, and lighting on both sides

Brick paver sidewalk, light poles, benches, planters, landscape plants, and trash receptacles
Intersection of F Street and Route 33 pavers

Crosswalk pavers and the intersection of Route 33 and Route 30

Prestressed Concrete Bulb-T Girder Design
- Bulb-T allows for longer span lengths
- Two Units of Spliced Post Tensioned Prestressed Concrete Bulb-T girders
  - Spans of 200'-240'-240'-200' each bridge
- Reduced the number of piers in deep water
- Competitive and economical when compared with structural steel
- Minimum maintenance in corrosive salt water environment

Girder Design
- All prestressed concrete girders
  - 8,000 psi
- Span lengths less than 120'
  - Class A5 concrete
- Span lengths over 120'
  - Class A5 Lightweight Aggregate Concrete
  - Unit weight of 115pcf
Deck Design

- Spans less than 120'
  - Class A4 concrete
  - 4,000 psi
- Spans over 120'
  - Class A5 Lightweight Aggregate Concrete
  - 5,000 psi
  - Unit weight of 110 pcf

Substructure Design

- Footers in the river designed to withstand ship collisions
- Class A3 Mass concrete for river elements
- Minimum concrete cover of 4" for re-steel
- Pile bents for marsh approach spans
- 24" prestressed concrete piles
- 66" prestressed concrete cylinder piles for bascule footers

Context Sensitive Philosophy Used For Design

- Landscaping
- Overlooks
- Bike/pedestrian trail
- Seating areas
- Brick pavers for sidewalks, crosswalks, and intersections
- Antique light posts for street lighting to match Town’s
- Brick pilasters on bridges

Concrete Quantities

- Class A3 Concrete
  - 30,406 CYS
- Class A4 Concrete
  - 10,723 CYS
- Class A5 Lightweight Aggregate Concrete
  - 12,574 CYS

- Not including the concrete in girders, KC-Rail, or piles
Research Efforts

- Virginia Transportation Research Council
  - Evaluating the use of Self Consolidating Concrete for prestressed concrete girders on Pamunkey project
  - Monitoring spliced girders
    - Instrumentation
  - Monitoring ground improvement pile fills
    - Instrumentation
  - Field sampling and testing some of the concrete as it is being placed in deck

Construction Issues

- River footing elevations
- Sequence of deck pours for spliced PT girders
  - Access
- Pumping of Lightweight Aggregate Concrete
- Spliced PT girder closures
- Tooth expansion joint installation
- Pressure wave monitoring

Construction Issues

- Re-Steel
  - Schedules & Detailing
  - Conflict at column/footer splice
  - Conflict at column/cap overlap
  - Extra moment steel in decks conflicting with shear connections with minimum bolster

- Reinforcing steel out of footing for columns
Construction Issues

- Bascule
  - Concrete grid filled deck placement
  - Cantilever corbels for barrier/warning gates
  - Balancing
  - Counterweight clearance

Most important

- Involve and use your designer throughout the construction process

Questions?